BAYOU DU LARGE SUBSEGMENT 120505 WATERSHED IMPLEMENTATION PLAN

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1.0 Introduction

According to the United States Environmental Protection Agency, nonpoint source pollution (NPS), unlike pollution from industrial and sewage treatment plants, comes from many different sources, such as rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and even our underground sources of drinking water. These pollutants can include: excess fertilizers, herbicides, and insecticides from agricultural lands and residential areas; oil, grease, and toxic chemicals from urban runoff and energy production; sediment from improperly managed construction sites, crop and forest lands, and eroding stream banks; salt from irrigation practices and acid drainage from abandoned mines; bacteria and nutrients from livestock, pet wastes, and faulty septic systems; and atmospheric deposition and hydromodification.

The effects of nonpoint source pollutants on specific waters vary and may not always be detrimental. However, states report that nonpoint source pollution is the leading remaining cause of water quality problems. In addition, it is known that these pollutants have harmful effects on drinking water supplies, recreation, fisheries, and wildlife.

The designated use of Bayou Du Large for anything other than a drainage canal is questionable. With the designated uses assigned to this bayou being primary and secondary contact recreation and fish and wildlife propagation, it may be difficult or impossible for this drainage canal to meet the stringent water quality criteria that come with these uses by using standard Best Management Practices. These uses carry with them the most stringent water quality criteria short of drinking water sources. Though this stream at one time may have been a more substantial and constantly flowing stream, it currently serves mainly as a drainage stream. The lower sections of the bayou also maintain water based on the tidal elevation of Marmande Canal. This section is simply a tidal backwater when it is not serving as a drainage canal for storm water or irrigation

Figure 1 Headwaters of Bayou Du Large

runoff.

The purpose of this plan is to outline a management strategy, which can be implemented with federal, state, and local funds, to reduce the amount of nonpoint source pollution entering Bayou Du Large and thereby increase water quality to a level where the waterbody can meet its designated uses.

Section 303(d) of the 1972 Clean Water Act (CWA) requires all states to develop a list of their state's impaired waterbodies. The 303(d) list of impaired waterbodies consists of those waterbodies that do not meet state regulatory water quality standards even with the current pollution controls in place and after point sources of pollution have installed the minimum levels of pollution controls and are in compliance with current permit processes and point source effluent limitations as outlined in Title 33 Environmental Quality Environmental Regulatory Code, Part IX, Water Quality (LDEQ, 2002).

The Bayou Du Large Watershed and waterways are on the CWA's Section 303(d) list as not meeting water quality standards for low dissolved oxygen and nutrients. Therefore, the Louisiana Department of Environmental Quality (LDEQ) and the United States Environmental Protection Agency (USEPA) have developed Total Maximum Daily Loads (TMDLs) for these pollutants. The CWA requires that states develop TMDLs for the waterbodies listed on the 303(d) list. TMDLs provide reduction goals for point and nonpoint source loading into the waterbody. LDEQ is developing implementation plans for the waterbodies/watersheds for which TMDLs have been developed.

1.1 Ecoregion Description

The Mississippi River Alluvial Plain (MRAP) ecoregion extends from the very southern tip of Illinois down through southeastern Missouri,

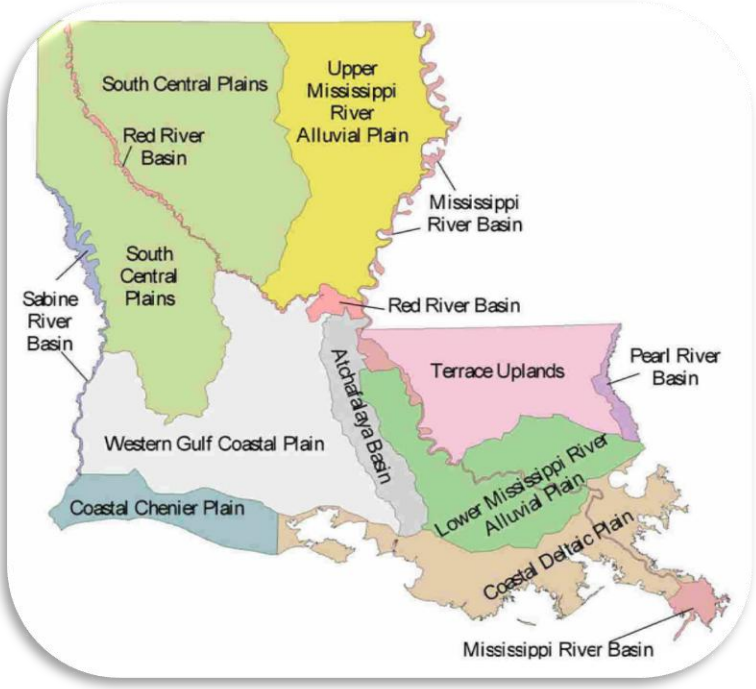


Figure 2 Map of Louisiana's Ecoregions

encompasses all of eastern Arkansas, the delta region of Mississippi and into northeast Louisiana then south following the Mississippi River to where its bottomland forests meet the coastal marshes. The ecoregion includes all or portions of East Carroll, West Carroll, Morehouse, Ouachita, Richland, Madison, Franklin, Caldwell, Tensas, Catahoula, LaSalle, Concordia, Avoyelles, Rapides, Evangeline, St. Landry, Pointe Coupee, West Feliciana, West Baton Rouge, East Baton Rouge, Iberville, St. Martin, Lafayette, Iberia, St. Mary, Assumption, Terrebonne, Lafourche, St. James, Ascension, St. John the Baptist, Livingston, Tangipahoa, St. Charles, Jefferson, Orleans, Plaquemines, and St. Bernard Parishes. The MRAP is rich in alluvial sediments, and is known primarily for its Bottomland Hardwood Forest, its natural community types, and its Cypress and Cypress-Tupelo Swamps. In addition, the northeastern portion of this eco-region contains both Wet and Mesic Hardwood Flatwoods which are found on Macon Ridge. Federal lands include Indian Bayou WMA (COE), Black Bayou Lake, Handy Break, Tensas River, Bayou Cocodrie, Catahoula Lake, Lake Ophelia, Grand Cote, Cat Island, Atchafalaya, and Bayou Teche NWRs. Wildlife Management Areas include Bayou Macon, Big Colewa Bayou, Floy McElroy, Russell Sage, Ouachita, Big Lake, Buckhorn, Mississippi River Alluvial Plain Ecoregion. Boeuf, Dewey W. Wills, Red River, Three Rivers, Grassy Lake, Spring Bayou, Pomme De Terre, Thistlethwaite, Sherburne, Joyce, Manchac, Maurepas Swamp, Attakapas Island, and Elm Hall. State parks include Chemin A Haut, Lake Bruin, Lake Fausse Point, and Cypremort Point. State historic sites include Poverty Point, Winter Quarters, Marksville, and Longfellow-Evangeline.

1.2 Terrebonne River Basin Description

The Terrebonne Basin covers approximately 1,712,500 acres in south-central Louisiana, and is bordered by Bayou Lafourche to the east, the Atchafalaya Basin floodway to the west, the Mississippi River to the north, and the Gulf of Mexico to the south. It varies in width from 18 miles to 70 miles. It includes all of Terrebonne Parish and parts of Lafourche, Assumption, St. Martin, St. Mary, Iberville, and Ascension Parishes. The topography of the entire basin is lowland, and all the land is subject to flooding except the natural levees along major waterways (LDEQ, 1994). The extreme northern portion of the basin is primarily agriculture lands which continue south along its eastern edge within the historic floodplains of the Mississippi River

and Bayou Lafourche. The western half of the basin consists of bottomland hardwood forests and cypress-tupelo-black gum swamps.

The coastal portion of the basin is prone to tidal flooding and is comprised of fresh and intermediate marsh inland to brackish and salt marsh near the bays and gulf. Approximately 729,000 acres of the Terrebonne Basin are wetlands which consist of about 21% freshwater swamp and 79% marsh.

The two primary water sources that enter this system are rain water and flood water from the Atchafalaya River, which contain nutrient-rich sediments that overwhelm the southwestern coastal marshes. There are roughly 57 species of freshwater fish, 12 species of mussels, and 10 species of crawfish found within the Terrebonne Basin.

Figure 3 Map of Terrebonne Basin

The 2004 Water Quality Inventory Report (LDEQ 2004) indicated that 31% of the 60 waterbody subsegments within the basin were fully supporting their two primary designated uses, while 66% of the subsegments were not supporting their designated use for fish and wildlife propagation. The suspected causes for these water quality problems include: metals, pesticides, nutrients, fecal coliform, non-native aquatic plants, organic enrichment and low concentration of dissolved oxygen, dissolved and suspended solids, pH levels, sedimentation/siltation, and turbidity. The suspected sources of the water quality problems include: non-irrigated crop production, pasture land, urban runoff, hydromodification, combined sewers and unsewered areas, surface runoff, and spills. Urban communities, home sewerage systems, and pasturelands are the primary sources of bacteria entering the Terrebonne Basin water bodies; therefore, efforts will be focused on reducing these problems. In addition, efforts should be taken to reduce the amount of sediments and nutrients entering the water bodies from agricultural lands in the upper part of the basin, in hopes that these water bodies will meet the fish and wildlife propagation use. The goal for the Terrebonne Basin as it pertains to water quality is to restore the designated uses of the basin, by reducing nonpoint source pollutant

levels entering the water bodies that have been identified as not meeting water quality standards.

2.0Watershed Land Use

Land use in the Bayou Du Large Watershed is 47% urban/built-up land. The majority of that being residential houses along the bayou. The houses are not concentrated in one area, but spread out along the banks of the bayou. The second major land use is agriculture with the primary crops being sugarcane and pastureland. A detailed land cover map of Subsegment 120505 gives a visual representation of the various land uses in the subsegment. Average annual precipitation in the segment, based on the nearest Louisiana Climatic Station, is 64 inches based on a 30-year period of record (LSU, 1999).

Table 1 Land Uses

Land Use/Land Cover	Acres	Percentage
Bare	74	5.6
Deciduous Forest Land	29	2.2
Forested Wetland	85	6.4
Pasture/Hay	217	16.3
Sugarcane	285	21.4
Urban or Built-up Land	626	47.2
Water	12	0.9

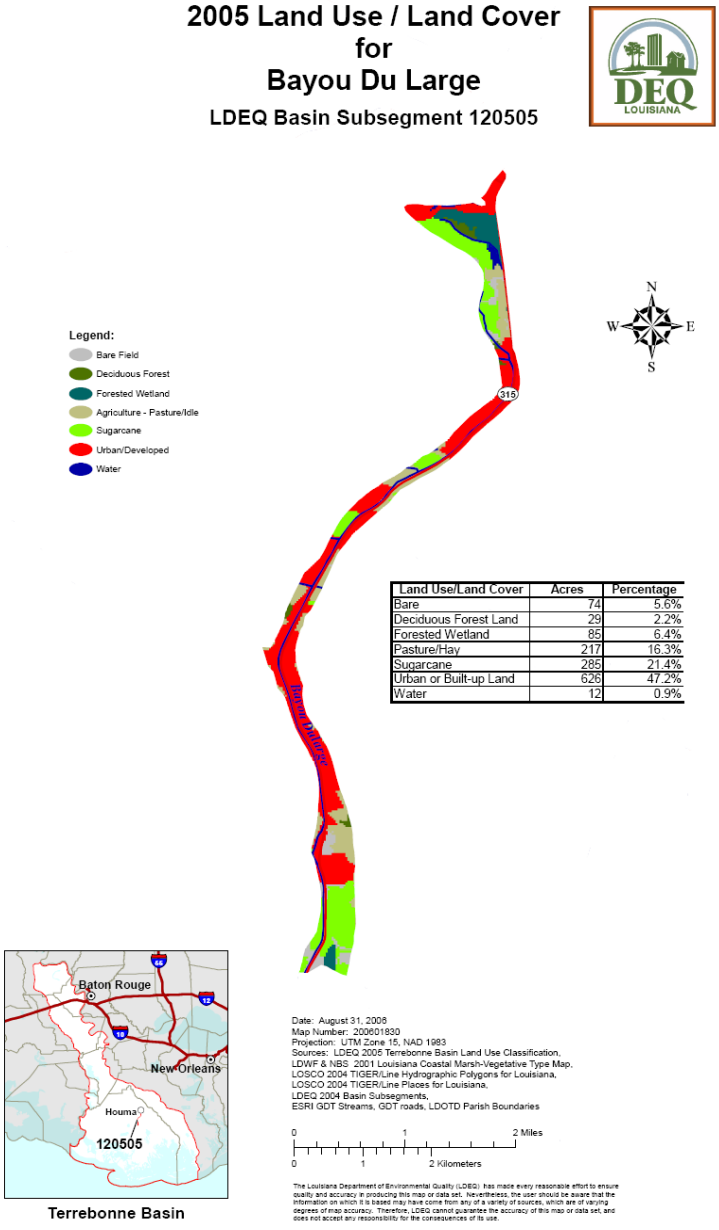


Figure 4 Land Use Map

2.1 Bayou Du Large Watershed Description

The modeled portion of Bayou Du Large is approximately 11km in length. Subsegment 120505 includes

Bayou Du Large from Houma to its confluence with Marmande Canal. This subsegment is tidally influenced. Water flows in either direction depending upon tides and wind conditions. This area is typical of the basin and is primarily comprised of agriculture and vegetated urban as documented in Table 1. Bayou Du Large begins at the headwaters with Old Bayou Du Large. This bayou travels south alongside the roadway where it meets with three distributaries. Duplantis Canal is located 4km from the headwaters. The unnamed ditch by the Terrebonne Parish Library is located 3km downstream from Duplantis. An unnamed canal intersects Bayou Du Large prior to its confluence with Marmande Canal another 2km downstream.

Figure 5 Old Bayou Du Large at Crozier Cemetery Gate (OBDL)

Figure 6 Bayou Du Large at Hidalgo St (BDL1)

Figure 7 Bayou Du Large at Melvin St (BDL2)

Figure 8 Old Bayou Du Large at confluence with Duplantis Canal (DC1)

Figure 9 Bayou Du Large at bridge on Tommy Darcy Dr. (BDL3)

3.0 Water Quality Analysis

LDEQ maintained one sampling location (0940) on Bayou Du Large as part of the Statewide Water Quality Monitoring Network. Data was collected from this site monthly in 2000 and periodically in 2005, which is located on Dr. Beautrous Bridge. Summer and winter projections of Bayou Du Large were modeled to quantify the point source and nonpoint source waste load reductions necessary in order for the bayou to comply with its established water quality standards and criteria. The designated uses and the water quality standards for Bayou Du Large are shown in Table 2. Water Quality Numerical Criteria and Designated Uses for Bayou Du Large. The primary standard for the TMDLs was the DO standard of 5 mg/L all year round.

Table 2 Water Quality Numerical Criteria and Designated Uses for Bayou Du Large

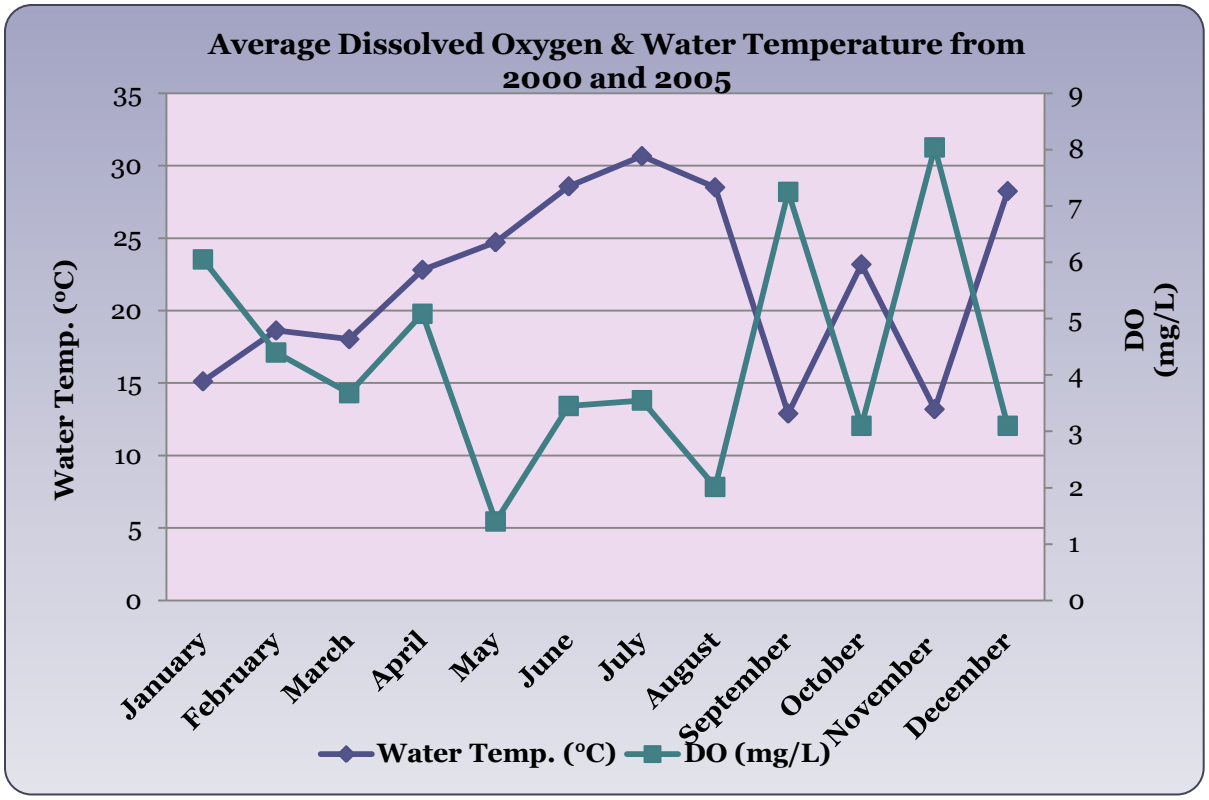
Water Quality Parameter	Numerical Criteria
Chloride (Cl) mg/L	500
Sulfate (SO4) mg/L	150
Dissolved Oxygen (DO) mg/L	5.0
pH	6.5-9.0
Bacterial Criteria (BAC)	See note 1
Temperature (°C)	32
Total Dissolved Solids (TDS) mg/L	1000
Designated Uses	A,B,C

USES: A – primary contact recreation; B - secondary contact recreation; C – propagation of fish and wildlife; D –drinking water supply; E – oyster propagation; F – agriculture; G – outstanding natural resource water; L – limited aquatic life and wildlife use.

Note 1 – 200 colonies/100mL maximum log mean and no more than 25% of samples exceeding 400 colonies/100mL for the period May through October; 1,000 colonies/100mL maximum log mean and no more than25% of samples exceeding 2,000 colonies/100mL for the period November through April.

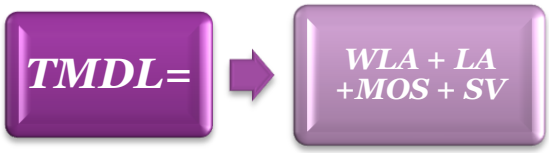
3.1. Water Quality Test Results for Bayou Du Large

The monthly average of dissolved oxygen (DO) and water temperature data from the years 2000 and 2005 were calculated to construct the graph showing the inverse relationship of DO and water temperature. In Bayou Du Large this trend was followed as the DO increased when the water temperature decreased. The water quality standard of 5.0 mg/L of dissolved oxygen was maintained only during January, September, and November, when the temperature was mild. Dissolved oxygen reached its lowest in May and August when the temperature was higher.



4.0 TMDL Findings

Total Maximum Daily Loads (TMDLs) are the maximum amount of a pollutant that can be discharged into a water body without causing the water body to become impaired and/or violate state water quality standards. TMDLs are the sum of the individual Waste Load Allocations (WLAs) for point sources, Load Allocations (LAs) for nonpoint and natural background sources, and a Margin of Safety (MOS).



Where: WLA= Waste Load Allocation (point sources)
LA= Load Allocation (non-point sources)
MOS= Margin of Safety
SV= Seasonal Variation

Bayou Du Large, Subsegment 120505, was on the 303(d) list beginning with the 1999 305 (b) report. The subsegment was found to be "not supporting" its designated use of Fish and Wildlife Propagation. It was found to be fully supporting

its designated use of Primary and Secondary Contact Recreation. Bayou Du Large was subsequently scheduled for TMDL development with other listed waters in the Terrebonne River Basin. The suspected causes of impairment were nutrients and low dissolved oxygen. The suspected sources were small flow dischargers and lagoons. Because of the impairment, this subsegment required the development of a total maximum daily load (TMDL) for oxygen demanding substances.

The Terrrebonne Parish Library was the only permitted discharger located in this subsegment. This discharger was small and need not be included in a model of this scale because it was unlikely that it would have an impact on the targeted waterbody due to the small load and/or the distance from the waterbody. In order to model loading into Bayou Du Large, the modeled section of the stream was divided into five reaches. A description of these five reaches is located in Table 3.

Table 3 Reaches of Bayou Du Large

Reach	Reach Description	Length (km)	Width (m)	Depth (m)
1	BDL1 to BDL2	1.2	4.267	0.140
2	BDL2 to BDL3	4.9	14.325	0.686
3	BDL3 to BDL4	1.4	14.630	0.664
4	BDL4 to BDL5	1.4	14.021	0.634
5	BDL5 to BDL6	1.6	13.411	0.686

The results of the projection model show that the water quality standard for dissolved oxygen of 5.0 mg/l can be maintained during the summer critical season with 85% reduction of man-made pollution. The minimum DO is 5.00 mg/l. There were no appropriate reference streams to calculate background conditions.

The results of the winter projection model show that the water quality criterion for dissolved oxygen of 5.0 mg/l can also be maintained during the winter critical season with 85% reduction in man-made nonpoint source pollution. The minimum dissolved oxygen is 5.00 mg/l.

Table 4 Total Maximum Daily Load

ALLOCATION	SUMMER		WINTER	
	% Reduction Required	(MAY-OCT) (lbs/day)	% Reduction Required	(NOV-APR) lbs/day)
Manmade Nonpoint Source LA	80	611	80	481
Manmade Nonpoint Source Reserve MOS (20%)	0	152	0	119
TMDL		763		600

There is a project in place called the Morganza to the Gulf Hurricane Protection Project. This project proposes a floodgate on Bayou Du Large southeast of Lake DeCade and a water control structure on Marmande Canal near the confluence with Bayou Du Large. With the addition of these control structures, the TMDL findings may be rendered obsolete.

Figure 6 Manmade Canal coming together with Bayou Du Large

Hurricanes Katrina and Rita created massive devastation to various watersheds. These natural disasters occurred after the survey data had been collected. It is feasible to consider that the water quality and hydrologic conditions may be somewhat different now. Therefore, the TMDL information would only be considered viable for pre-hurricane conditions.

Based on the amount of reduction required, a use attainability analysis (UAA) for Barataria-Terrebonne by the standards and assessment division of LDEQ has proposed a criteria change for Bayou Du Large. The new DO standards would be 3.8 mg/L from April to August and 5.0 mg/L from September to March. With these changes introduced, the load reductions for the Bayou Du Large subsegment could be marginally different.

Based on the current TMDL findings, an 85% reduction of all man-made loading is not feasible. It is still recommended that best management practices be applied to the area, in hopes of improving the water quality of Bayou Du Large.

5.0 Sources of Nonpoint Source Pollution Loading

Nonpoint source water pollution often results from many different sources in the watershed. Therefore, identifying all the types of land use, the land cover, and the distribution of each type within the watershed boundary is an important key for managing sources of NPS pollution. This type of information provides insight of where and what the sources of NPS pollutant loadings are. Land use activities such as agriculture, urban, forestry and natural systems can contribute to the pollutant loading of the waterway.

The 2006 court ordered 303(d) list indicates the suspected causes of impairment and the suspected sources of impairment in Table 5.

Table 5 303(d) List of Suspected Causes and Suspected Sources of Impairment

Chloride	Drought-related Impacts
Nitrate/Nitrite (Nitrite + Nitrate as N)	On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)
	Package Plant or Other Permitted Small Flows Discharges
	Total Retention Domestic Sewage Lagoons
Non-Native Aquatic Plants	Introduction of Non-native Organisms (Accidental or Intentional)
Oxygen, Dissolved	On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)
	Package Plant or Other Permitted Small Flows Discharges
	Total Retention Domestic Sewage Lagoons
Phosphorus (Total)	On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)
	Package Plant or Other Permitted Small Flows Discharges
	Total Retention Domestic Sewage Lagoons
Sulfates	Drought-related Impacts
Total Dissolved Solids	Drought-related Impacts

5.1. Agriculture

Agriculture occupies the second largest percentage of land within the Bayou Du Large watershed. The primary agricultural crops consist of sugarcane and pastureland/idle land. Nutrient, pesticide, and sediment loading are associated with these two forms of agriculture.

5.1.1. Row Crop

Sugarcane is the only type of row crop in this watershed. The common practice for preparing row crops is soil tillage. Erodible soils that have a "K-factor" (soil erodibility factor) greater than 0.4 are more susceptible to erosion when tilled or devoid of vegetation. When rainfall occurs, the soil can be easily washed into the receiving stream. This sediment runoff is often laden with fertilizers, pesticides and herbicides that can result in NPS pollutant loading into the river. With there being little or no flow in Bayou Du Large, the NPS load can deposit and accumulate on the stream bottom. As the seasons progress, warm temperatures increase the rate that these

pollutants degrade, consuming the DO in the receiving stream.

Figure 8 Example of a Row Crop - Sugarcane

5.1.2. Pastureland

Pastures require large amounts of fertilizer in order to keep a healthy food supply for the grazing animals and the production of hay. Excessive fertilizer near waterways will increase the probability of nutrients getting washed into the bayou. In addition, livestock can produce a large amount of fecal waste. This waste may contain a considerable amount of nutrients. Rainfall can carry this waste to nearby waterways where nutrients can lead to eutrophic conditions that promote algae growth and reduce oxygen levels. Livestock can also contribute to increased sediments entering a water body. When cattle are concentrated in a single location, such as feeding and water areas, they often remove vegetation cover and expose the soils beneath. This soil can be dislodged by rainfall and then be carried to water bodies by runoff. Sediment increases the turbidity of water, thereby reducing light penetration, impairing photosynthesis, altering oxygen relationships which in turn may reduce the food supply for certain aquatic organisms.

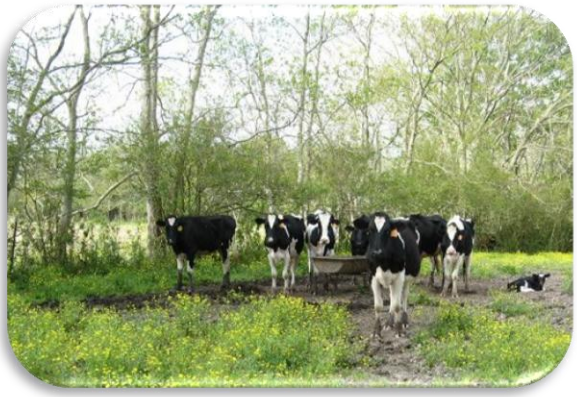


Figure 7 Example of Pasture Land

5.2. Urban

Urban/residential development constitutes the largest land use in the Bayou Du Large watershed. Sources of NPS urban pollutants include lawns, driveways, rooftops, parking lots, and streets. Urban areas have higher amounts of impervious surfaces, which affect water quality and water quantity. Commercial parking lots and streets are the largest contributors to runoff. In places where little infiltration occurs, nearly all rainfall becomes runoff.

Streets produce some of the highest concentrations of phosphorus, suspended solids, bacteria, several metals, and disproportionately higher amounts of total runoff from the watershed. Streets typically contribute four to eight times the pollutant load of all other sources.

The reason is that curbs along streets are effective at trapping and retaining fine particles. The build-up of pollutants gets washed off quickly during storms and is efficiently delivered to the receiving waterbody. In addition, lawns contribute the highest amounts of nitrogen and fecal coliform. The runoff from parking lots and driveways is contaminated with oil, grease, and metals.

5.3. Home Sewage

Failing individual septic systems, whether from lack of maintenance, improper installation, improper

Figure 9 Old Service Station on LA 315

design, or a combination thereof is a key source of NPS pollutants. This is a classic case of "out of sight, out of mind". Failing septic systems result in discharges of untreated wastewater containing harmful bacteria and organic compounds. The pollutants of concern that are associated with this type of waste are fecal coliform, nitrogen compounds, phosphorus, and organic materials. Local drainage ditches are where most of the untreated wastewater tends to accumulate.

Without a sustained flow of water, build-up of excess nutrients and organic matter from septic systems can quickly deplete dissolved oxygen levels, often resulting in anaerobic/anoxic conditions. Most of the "beneficial" microorganisms, including the natural predators of harmful bacteria require oxygen in order to survive. However, E. coli can survive with or without oxygen in untreated septic discharges. Each time a rain event occurs in the rural areas of the watershed, the accumulated deposits of untreated wastewater from failing home septic systems get washed directly into the bayou.

Another component to the pollution caused by onsite disposal systems is the inadequate enforcement of the State Sanitary Code. No disposal system should be installed without first obtaining a permit from the State Health Officer. The Department of Health and Hospitals regulations describe the acceptable capacities, materials, and construction of septic tanks, field lines, sand filters and oxidation ponds.

5.4. Non Native Aquatic Plants

Bayou Du Large had areas which were densely populated with non-native aquatic plants such as

hyacinth. Water hyacinth is listed as one of the 16 most productive plants on earth and is considered the world's worst aquatic plant. It forms dense mats which interferes with navigation, recreation, irrigation and greatly diminishes water flow. Water hyacinths can cause severe environmental issues such as greatly reducing biological diversity. Native submersed plants can be eliminated due to hyacinth mats blocking sunlight. These plant mats can slow currents, causing increased siltation which can lead to water quality impairments.

Figure 10 Non-Native Species in Bayou Du Large

6.0 Nonpoint Source Pollution Solutions

The causes of nonpoint source pollution are diverse and may be non-specific in character. Therefore, control and prevention techniques may take many forms with the intention of addressing local conditions that are contributing to NPS pollution impacts. These techniques are typically called Best Management Practices (BMPs). A large variety of BMPs have been developed and modified by various groups and agencies over the last two decades to minimize or inhibit NPS pollution impacts. Best Management Practices may take many forms, including regulatory land use controls, pollution source controls, structural land use management practices, vegetative practices and activity management practices. On-going public education and increased awareness about NPS pollution impacts and prevention is extremely important to the success of monitoring and implementation of BMPs. Establishing goals in association with Best Management Practices to address nonpoint source pollution heightens awareness of NPS pollution problems. It can facilitate proactive and hands-on planning by the town and private developers that can lead to better management of NPS pollution impacts through earlier focus and recognition of potential problem situations. Early identification of NPS pollution impacts can help minimize or eliminate consequent adverse effects to the environment and to human health. BMPs are seldom employed alone. The average cost and load reductions were obtained from an employee of the LDAF/OSWC, and can be obtained from the NRCS eFOTG web page, http://www.nrcs.usda.gov/technical/efotg/ , unless otherwise noted

(LDAF 2008); the numbers in parenthesis represent the practice code. The efficiency of many BMPs can be augmented by employing others which complement them. A summary of the effectiveness of favorable BMPs is provided in Louisiana's Nonpoint Source Management Plan (LDEQ, 2000). http://nonpoint.deq.louisiana.gov/wqa/default.htm

6.1. Agriculture BMPS

BMPs are generally associated with the management of soil, nutrients, pesticides, and water, which are known to be a contributing source of NPS pollutant loading. If fertilizers, herbicides, and pesticides remained in the fields, the NPS load would be less. Therefore, sites should be managed in such a way that the surface runoff rate is not excessive and that it is not contaminated. Reducing NPS loading from agricultural fields will require a concerted effort between all the associated federal, state, and local agencies. Proper management will require agriculture programs which provide environmental education as well as effective production strategies. Agriculture programs should be designed to foster a sense of conservation stewardship for each type of agricultural producer. Examples of these programs are the Louisiana Master Logger Program and the Louisiana Master Farmer Program. For successful agricultural programs to continue in the watershed, all the cooperating entities will need to participate. The key partners (i.e. NRCS, SWCD, LDAF, LCES, LDNR, and FSA) are the federal, state, and local agencies, which provide funding through cost-share assistance, incentives, expertise through technical assistance, and education through information outreach programs to the farmers. A complete list of agriculture BMPs is provided by the NRCS in the "Technical Guide Handbook". The handbook includes a description of each BMP and their recommended uses. LDEQ has a comprehensive list of BMPs for controlling NPS pollutant loads, programmatic goals and activities, and future objectives and milestones included in the State of Louisiana Water Quality Management Plan, Volume 6, Louisiana's Nonpoint Source Management, 2000.

6.1.1. Row Crop BMPs

Sugarcane is the highest valued row crop grown in Louisiana (LSU AgCenter, 2007). It is also the predominant crop grown in subsegment 120505 (285 acres). For sugarcane production to continue to thrive in Louisiana, responsible management of soil and water resources should be a priority.

Conservation Tillage

Conservation tillage allows crop residue (plant materials from past harvests) to remain on the soil surface thereby reducing runoff and soil erosion, conserving soil moisture, holding nutrients and pesticides on the field, and improving overall soil, water, and air quality. Conservation tillage involves planting and growing crops with minimal disturbance of the surface soil. No-till farming, a form of conservation tillage, is used to seed the crop directly into vegetative cover or crop residue with no disturbance of the surface soil. Minimum tillage farming involves some disturbance of the soil, but uses tillage equipment that leaves much of the vegetative cover or crop residue on the surface. The average cost of residue and tillage management in Louisiana is $25.00/acre (Louisiana Department of Agriculture and Forestry, 2008), and demonstrates a slight to moderate BMP effectiveness.

LDEQ funded a project in the Bayou Wikoff sub-watershed of Bayou Plaquemine Brule in the Mermentau Basin. The purpose of this project was to gather information on the effectiveness of best management practices in reducing nonpoint source pollutants from sugarcane fields. The results indicated that when mulch residue was left on the field after harvest, that total solids could be reduced by 34%, suspended solids by 26%, turbidity by 60% and phosphorus by 8% compared to fields where the sugarcane residue was burned. Therefore, leaving the mulch on the field after harvest will reduce the amount of nonpoint source loadings into the bayou.

Crop Nutrient Management

Crop Nutrient Management fully manages and accounts for all nutrient input to help ensure nutrients are available to meet crop needs while reducing nutrient runoff from the fields. It also serves as a way to prevent excessive buildup in soils and helps protect air quality. Nutrient management plans detail the optimum use of nutrients to minimize nutrient loss while maintaining crop yield. Soils, plant tissue, manure and/or sludge tests are used to develop application rates that meet projected crop yields based on soil productivity or historic yields of a site. With plan implementation, nutrient applications follow guidelines for the amount, timing, and placement on each crop. Nutrient management is substantially effective as a BMP in reducing nutrients in runoff. Average cost in Louisiana can range from $21.00 to $109.00 per acre, according to the Louisiana Department of Agriculture and Forestry.

Pest Management

Pest Management consist of a variety of methods for keeping insects, weeds, disease, and other pests below economically harmful levels while protecting soil, water, and air quality; It can go hand in hand with eco-friendly landscaping; mulch properly; improve drainage and aeration of landscape beds; manage weed populations; attract beneficial insects that are natural enemies of plant-damaging insects; select landscape plants based on their adaptability to local growing conditions; follow certain upkeep or cultural practices such as proper pruning, fertilization and irrigation. In addition, periodic monitoring of key pest infestations may result in a reduction of pesticide usage. Always apply pesticides under appropriate label recommendations and only when they are necessary for protection of the crop. Wind direction and speed should be carefully monitored before pesticide applications are made to prevent unwarranted drift to non-target locations. Select pesticides which give the best results with the least potential impact to the environment. Average cost of pest management BMPs in Louisiana can range from $20.00 to $135.00 per acre, and is a substantially effective BMP in reducing pesticides from runoff.

Vegetated Filter Strip

A general and cost effective practice is to maintain a strip of vegetation around the perimeter of each field site and within the field ditches. This practice is similar to the BMP referred to as vegetative filter strip or field border and the grassed waterway, except use of native vegetation for cover is encouraged. If the grassed waterway is covered with wetland plants and/or native grasses, the drainage way can also function as a form of passive biological treatment, which can also reduce NPS loads. The amount of herbicides used should be less, saving costs. Sites with a healthy cover of vegetation have less runoff.

Irrigation Water Management

Irrigation Water Management is the process of determining and controlling the volume, frequency, and application rate of irrigation water in an efficient manner. It reduces nonpoint source pollution of ground and surface waters caused by irrigation systems. Irrigation practices that can reduce or prevent erosion include:

- Using cover crops on unprotected, easily erodible soils (NRCS Code 340).
- Manage crop residues to reduce surface water contamination (NRCS Code 344).

- Use conservation tillage practices (NRCS Code 329).
- Precision level the land to optimize furrow slopes to reduce soil erosion (NRCS Code 462).
- Install tailwater drop structures (NRCS Code 447). Tailwater from furrow irrigation and runoff caused by excessive irrigation or poor system design can make its way into drainage ditches which eventually make its way to streams, lakes and bayous.

"Irrigation return flow" is that portion of water that returns to its source after being used to irrigate crops. This is an important environmental issue due to its potential to be a source of nonpoint source pollution. Excessive runoff is a symptom of poor irrigation system design or poor management of irrigation water. Practices that address treatment of sediment laden water include:

- Install sedimentation basins (NRCS Code 350).
- Install vegetative buffering (filter) strips (NRCS Code 393).
- Collect and reuse surface runoff (NRCS Code 570).

Irrigations systems, although sometimes costly, can be substantially effective at removing nutrients, pesticides, sediment, organic matter and bacteria from runoff.

Additional Best Management Practices for sugarcane can be found at http://www.lsuagcenter.com/NR/rdonlyres/E82EC6A3-0FC4-4BDC-8793-9222CE4E4697/3155/pub2833Sugarcane4.pdf

6.1.2. Pastureland BMPs

Pastureland occupies the second largest portion of agricultural land use in the watershed. Pastureland BMPs should focus on measures to control the amount of sediment, nutrients, and fecal coliform in the surface waters draining from the field site. Knowledge of the field sites' delineation and drainage pattern can be helpful when identifying pathways and potential sources of NPS pollutants. During or shortly after a rainfall event is the best time to make this assessment. With this information, the operator can work strategically to implement the BMPs that prevent pollutant sources and/or prevent them from leaving the site.

Grazing Management

Grazing Management is the manipulation of animal grazing to achieve optimum and sustained animal, plant, land, environmental or economic results while insuring a continuous supply of forages to grazing animals. Water quality

impacts of livestock grazing and browsing activities on pasture and range lands are minimized by controlling the conditions in which the livestock will graze. For example, by installing a trough or tank to supply water for livestock, farmers can provide a drinking source at specific locations that will protect vegetative cover. Water facilities range in price depending on size ($150.00 for 50-100 gallon trough, $270.00 for 570 gallon trough, $406.00 for 720 gallon trough and $450.00 for a trough larger than 720 gallons). This practice reduces or eliminates the need for livestock to be in or near the streams and therefore will reduce livestock waste in waterways (LSU AgCenter, 2002). Please refer to the "Beef Production Best Management Practices" document located on the website www.lsuagcenter.com for more information.

Riparian Buffer Zone Protection

Protecting the riparian zone along Bayou Du Large is necessary to prevent sediment, nutrients, and organic matter from entering the bayou. Livestock frequently access these areas to obtain water, shade, and lush vegetation. The hoof traffic along the stream banks can cause serious sediment and fecal coliform loading. Fencing can be used to protect the riparian zone from the damage caused by livestock. When livestock are restricted from the riparian buffer zone, the producer should make accommodations to provide an alternative source of water, shade, and food. Water troughs should be placed on top of a concrete pad to prevent further erosion problems from occurring.

6.2. Urban BMPs

Preventing NPS pollutant loading in urban areas of the watershed involves managing existing sources of pollution and preventing new ones. NPS pollution is driven by stormwater runoff, therefore BMPs should be focused on management strategies that prevent or reduce sources of NPS pollution. Increasing the public's level of environmental awareness is the first step for solving these types of problems in the urban areas of the watershed. Another consideration is current and future development in the watershed that may cause a NPS load. Decisions regarding land-use planning and protection of urban water resources are usually governed at the municipal level. For controlling sources of NPS pollution, BMPs are best implemented through site plan controls, stormwater management plans, subdivision agreement, local ordinances, and erosion and control guidelines and standards. When attempting to implement such BMP programs, success will depend upon whether the local public has a clear understanding of the program, its

overall goals and objectives. Examples of these objectives include measures such as:

- Minimize impervious areas to decrease runoff quantity and quality from source areas
- Conserve the critical and sensitive areas of the watershed
- Protect local streams and rivers from adverse effects of urbanization
- Preserve open-space land for aesthetics and recreation while also preserving water quality
- Provide fair sharing of costs and benefits of protecting water quality

Table 6 Percentage of Pollutant Removal using Common Urban BMPs

BMP	Total Suspended Solids	Total Phosphorus	Nitrate and Nitrite
Dry Ponds	*47%*	*19%*	*4%*
Wet Ponds	*80%*	*51%*	*43%*
Infiltration Systems	*95%*	*70%*	*82%*
Filtration Systems	*86%*	*59%*	*-14%*
Bioswales	*81%*	*34%*	*31%*
Wetlands	*76%*	*49%*	*67%*

6.2.1. Public Education and Participation BMPs

Public education and voluntary action are important components of watershed protection and water quality improvement. Public education should begin before BMP implementation occurs because it will be critical during implementation. Citizens, particularly property owners, need to know the objectives for implementing BMPs, the benefits to the community and to themselves, and ways in which they can participate. Citizens generally respond positively when they understand what is occurring and why. Conversely, the public may react negatively to programs or activities to implement BMPs when they are poorly informed about why they are needed. Public awareness affects the acceptability of mandatory controls, the effectiveness of voluntary measures, and the degree of support provided by elected officials. A public education campaign can improve the feasibility of implementing BMPs to protect water quality and is critical for effective implementation.

6.2.2. Lawn BMPs

Nutrient levels in urban streams, of course, represent a composite of many different sources and pathways, of which lawn care is but one. However, the runoff coming off lawns is known to contribute to some of the highest NPS pollutant loads in an urban area such as fecal coliform and nutrients. Homeowners have an important role to play in residential source control. Less lawn fertilizer,

more pet clean-ups, bio-degradable/phosphate free car wash products and more frequent driveway sweeping could collectively reduce NPS pollutants resulting from residential lawns areas. People should practice picking up their pet waste each time they take them out for a walk and properly disposing of it. The lawns in urban areas are usually landscaped with beautiful and exotic plants and grasses that often require large amounts of nutrients and water, which can cause polluted runoff. Instead, lawns should incorporate infiltration techniques that intercept and control runoff. A BMP that can be used on residential lawns is rain gardens. Rain gardens are natural depressions or can be man-made in the landscape that serves as a collection site for runoff that has been routed to them. The rain garden incorporates the use of wetland plants (facultative species), which help uptake the runoff water and return it back to the atmosphere by evapotranspiration. Another practice that is becoming more popular is to landscape with native plants. Native plants require less input in the form of maintenance and fertilizers, since they grow naturally in the local environment. Native plants used near runoff areas or in conjunction with drainage ditches and infiltration areas can function to mitigate NPS pollution at its source. Open channels can manage contaminated runoff by way of filtration, infiltration, retention, and remediation thus cleansing the water before it enters the bayou.

6.2.3. Street BMPs

Streets are identified as the leading source of urban NPS pollution. As stated, the amount of impervious cover strongly influences water quality. Since streets are the main conduit for public transportation in urban areas, they comprise most of the impervious cover in the watershed. Managing the pollution they contribute can significantly reduce the NPS load. Use of permeable road surfaces is another BMP that can reduce the amount of runoff due to infiltration. Another practice is proper disposal of litter and trash recycling. This will prevent trash and litter from being washed into local storm drains and into the river. For housing residents, they could practice composting techniques. This is a good way to recycle leaves, grass clipping, along with other debris, in order to keep them from being washed to the streets, into the storm drains, then into the river. Another BMP is to develop infiltration trenches or rock reed filters, where possible along the streets that serve to collect excess runoff and absorb NPS pollutants. Runoff that is flowing from streets can then be routed to such areas that are set-aside for this purpose.

6.3. Home Sewage BMPs

Failing home septic systems have the potential to cause significant problems in the watershed by contributing nutrients, organic matter and fecal coliform bacteria. Prevention practices include: proper installation, location, size, and operation and maintenance. Septic systems should not be installed without obtaining the proper permits from the State Health Officer. In addition, sewer systems should be inspected and pumped out every 3-5 years by a licensed professional.

The following management measures have been adapted from the 2005 EPA guidance "National Management Measures to Control Nonpoint Source Pollution from Urban Areas". In this document, EPA provides an in-depth review of the strategies that can be utilized to control the impacts of past, present and future onsite disposal systems. Please refer to the following website to view this document: www.epa.gov. Proper installation of onsite disposal systems is pertinent to effectively removing and treating contaminants such as pathogens, biochemical oxygen demand (BOD) and nutrients in human sewage. Many onsite disposal systems fail due to age, inappropriate design or poor maintenance. Onsite wastewater treatment system permitting and installation programs, which adequately protect water quality, should be developed. Programs should include the following:

- Processes to identify and protect sensitive areas (e.g. shellfish areas).
- Education, training, licensing, and/or certification programs for system designers, site evaluators, permit writers, installers and inspectors.
- Inspections of new on-site systems during and immediately following construction/installation to ensure that design and siting criteria are applied appropriately.
- Periodic inspection and monitoring requirements to ensure that onsite systems are functioning properly.
- Process to identify and protect sensitive areas (e.g. shellfish areas). Education, training, licensing, and/or certification programs for system designers, site evaluators, permit writers, installers and inspectors. Inspections of new on-site systems during and immediately following construction/installation to ensure that design and siting criteria are applied appropriately.
- Periodic inspection and monitoring requirements to ensure that onsite systems are functioning properly.

Tips for Maintaining Your Septic System

- Do not put too much water into the septic system; typical water use is about 50 gallons

per day for each person in the family.
- Do not add materials (chemicals, sanitary napkins, applicators, and so on) other than domestic wastewater.
- Restrict the use of your garbage disposal.
- Do not pour grease or cooking oils down the sink drain.
- Make a diagram showing the location of your tank drain field and repair area.
- Install a watertight concrete riser over the septic tank to simplify access.
- Periodically have the solids pumped out of the septic tank.
- Maintain adequate vegetative cover over the drain field.
- Keep surface waters away from the tank and drain field.
- Keep automobiles and heavy equipment off the system.
- Do not plan any building additions, pools, driveways, or other construction work near the septic system or the repair area.

For more examples and information on best management practices please refer to: http://www.epa.gov/owow/NPS/ex-bmps.html.

7.0 Making the Implementation Plan Work

In order to implement BMPs and other conservation practices which reduce the NPS load in the Bayou Du Large watershed so that it meets its designated uses and is no longer listed on the 303(d) list, it will be necessary to have programs that provide technical assistance, funding, incentives, as well as foster a sense of stewardship. Many of these programs that are designed to assist the landowner are already in place. The LDEQ's Nonpoint Source Unit provides monies distributed through the USEPA under Section 319 of the CWA. The funds are utilized to implement BMPs for all types of land uses within the watershed in order to reduce and/or prevent the NPS pollutants and achieve the river's designated uses. The USDA and NRCS are federal government agencies that have several such programs made available by way of the Farm Security and Rural Investment Act of 2002. These programs are made available through the local Soil and Water Conservation District (SWCD). The NRCS has a list of BMPs for almost all types of agriculture and programs to facilitate their use. Parish-wide cooperation and coordination will be necessary in order to protect the water quality within the watershed. Though challenging, it is an opportunity and reason for leaders, officials, and local citizens to come together for a common interest. The watershed approach helps build new levels of cooperation and coordination, which is necessary to successfully control NPS loading. The local community should realize that their involvement and

commitment, or lack thereof, in the programs and/or recommendations will make the difference in whether the water quality of their Bayou improves or continues to disintegrate.

7.1. Regulatory Authority

Section 319 of the Clean Water Act (PL 100-4, February 4, 1987) was enacted to specifically address problems attributed to non-point sources of pollution. Its objective is to restore and maintain the chemical, physical, and biological integrity of the nation's waters (Sec. 101; PL 100-4). Section 319 directs the governor of each state to prepare and submit a non-point source management program for reduction and control of pollution from non-point sources to navigable waters within the state by implementation of a four-year plan, submitted within 18 months of the day of enactment (LDEQ, 2000).

In response to the federal law, the State of Louisiana passed the Revised Statute 30:2011, which had been signed by the Governor in 1987, as Act 272. Act 272 designated the Louisiana Department of Environmental Quality (LDEQ) as the Lead Agency to develop and implement of the State's Non-point Source Management Plan. LDEQ's office of water resources (OWR) was charged with the responsibility to protect and preserve the quality of waters in the State and has developed the non-point source management program, ground water quality program and a conservation and management plan for estuaries. These programs and plan were developed in coordination with the appropriate State agencies such as the Department of Natural Resources, the Department of Wildlife and Fisheries, the Department of Agriculture and Forestry and the State Soil and Water Conservation Committees in various jurisdictions (La.R.S. 30:20). LDEQ's office of water resources is therefore responsible for receiving federal funds to ensure clean water, providing matching State funds when required and complying with terms and conditions necessary to receive federal grants.

The water quality standards are described in LAC 33:IX.1101.D in chapter 11 (LDEQ, 2003). These standards are applicable to surface waters of the state and are utilized through the waste load allocation and permit process to develop effluent limitations for point source discharges to surface waters of the State. The water quality standards also form the basis for implementing the best management practices for control of non-point sources of water pollution.

Chapter 11 also describes the anti-degradation policy (LAC 33:IX.1109.A.2) which states that the

administrative authority will not approve any wastewater discharge or certify any activity for federal permit that would impair water quality or use of state waters. Waste discharges must comply with applicable state and federal laws for the attainment of water quality goals. Any new, existing, or expanded point source or non-point source discharging into state waters, including land clearing, which is the subject of a federal permit application, will be required to provide the necessary level of waste treatment to protect state waters as determined by the administrative authority. Further, the highest statutory and regulatory requirements shall be achieved for all existing point sources and best management practices (BMPs) for non-point sources. Additionally, no degradation shall be allowed in high-quality waters that constitute outstanding natural resources, such as waters of ecological significance as designated by the office. Those water bodies presently designated as outstanding resources are listed in LAC 33:IX.1123.

7.2. Actions Being Implemented by LDEQ

The LDEQ is presently designated the lead agency for implementation of the Louisiana Nonpoint Source Program. The LDEQ Nonpoint Source Unit provides USEPA §319(h) funds to assist in implementation of BMPs and to address water quality problems on subsegments listed on the §303(d) list or those subsegments which are located within Category I Watersheds as identified under the Unified Watershed Assessment of the Clean Water Action Plan. USEPA §319(h) funds are utilized to sponsor cost sharing, monitoring, and education projects. These monies are available to all private, for profit, and nonprofit organizations that are authenticated legal entities, or governmental jurisdictions including: cities, counties, tribal entities, federal agencies, or agencies of the State. Presently, LDEQ is cooperating with such entities on approximately 40 nonpoint source projects which are active throughout the state.

7.3. Actions Being Implemented by Other Agencies

Barataria-Terrebonne National Estuary Program

The Barataria-Terrebonne National Estuary Program has coordinated federal, state, and local agencies, the citizens and the environmental community to assist in establishing priorities for this special part of the state. All of these priorities were compiled into a set of Action Items, which comprise the Comprehensive Conservation and Management Plan. The staff within the BTNEP has formed Implementation Teams that will work together on these Action

Items to ensure that they are implemented throughout the two management basins that form the BTNEP. The staff has worked closely with NPS Program staff on water quality issues related to nonpoint sources of pollution. This working relationship will continue as LDEQ collects water quality data, develops TMDLs and implements watershed management strategies in the Barataria and Terrebonne basins.

Natural Resource Conservation Service

The NRCS has been actively involved in both the development and implementation of Action Items related to agricultural issues in the Barataria and Terrebonne basins. They have prioritized watersheds within these basins for basin studies and have worked with the state's NPS Program on implementation of sugarcane best management practices. This working relationship will continue as the cooperating agencies that serve on Implementation Teams work on the Action Items that were identified within the Comprehensive Conservation and Management Plan as agricultural issues.

2003 Farm Bill

Provides funding to various conservation programs for each state by way of the NRCS and local Soil and Water Conservation Districts (SWCD). The following includes a brief summary of the programs available through the local SWCD under the oversight of USDA and NRCS. The descriptions of the programs are general and are subject to change.

- Environmental Quality Incentive Program (EQIP) - provides 75% - 90% cost share for environmentally beneficial structural and management alterations, primarily 60% to livestock operations. Applications prioritized for benefits. It is considered the "Working Lands" program.

- Wildlife Habitat Incentive Program (WHIP)-also provides 75% - 90% cost share but for the costs of wildlife habitat restoration and enhancement on private lands. This program available to eligible private property owners and lessees for installing riparian buffers, native pine & hardwoods, wildlife corridors and other wildlife enhancing measures for 5 – 10 year contracts.

- Wetland Reserve Program (WRP)-is a voluntary program for wetland restoration, enhancement and protection on private lands. WRP provides annual payments and restoration costs for 10 year, 30 year, or perpetual easements on prior converted wetlands. Louisiana leads the US in WRP participation. The

2002 Farm Bill total funding allocation was $1.5 billion and it expanded the program to purchase long-term easements and cost sharing to agriculture producers.

- Conservation Reserve Program (CRP)-The 1985 Farm Bill established CRP as a voluntary program to protect highly erodible and environmentally sensitive lands. CRP places a positive value on rural environment by improving soil, water, and wildlife, and extends a pilot sub-program called the Conservation Reserve Enhancement program.

- Conservation Security Program (CSP)-is a new national incentive payment program for maintaining and increasing farm and ranch stewardship practices. The CSP is designed to correct a policy disincentive in which independently conducted resource stewardship has disqualified many farmers from receiving conservation program assistance. CSP features an optional "tiered" level of farmer participation where higher tiers receive greater funding for greater conservation practices.

- Farmland Protection Program (FPP)-provides funding to states, tribes, or local governments and to nonprofit organizations to help purchase development rights and protect farmlands with prime, unique, or productive soil; historical or archaeological significance; or farmlands threatened by urban sprawl. Louisiana does not currently have any FPP contracts.

- Grassland Reserve Program (GRP)-is also a new program created to enroll up to 2 million acres of virgin and improved pastureland. GRP easements would be divided 40/60 between agreements of 10, 15, or 20-years, agreements and easements for 30-years and permanent easements to restore grassland, rangeland and pasture through annual rental payments.

- Small Watershed Rehabilitation Program (SWRP)-provides essential funding for the rehabilitation of aging small watershed impoundments and dams that have been constructed over the past 50 years.

Louisiana Department of Agriculture and Forestry

LDAF has also worked with the BTNEP on development of action items that were contained in the Comprehensive Management Plan. Their soil and water conservation districts are the primary link with the farmers and landowners that can implement best management practices on their lands. As the Action Items contained with the

CCMP are addressed, these districts will continue to play a major role in their implementation.

LSU Agricultural Center

LSU has worked closely with the state's NPS Management Program to evaluate best management practices for sugarcane. These practices have included conservation tillage, pesticide and nutrient management practices and the affect that new sugarcane harvesting methods have on pollutant transport from the fields. The sugarcane industry is constantly changing to meet the demands of a competitive market, so environmental practices need to keep pace with these changes and recommend the most innovative practices for the farmer. LSU has developed The Master Farmer Program, which is used to encourage on-the-ground BMP implementation with a focus on environmental stewardship. The LSU AgCenter is promoting this program to help farmers address environmental stewardship through voluntary, effective and economically achievable BMPs. The LSU AgCenter will tailor its Master Farmer Program to meet the needs of the producers in the watershed area. The program will be implemented through a multi-agency/organization partnership including the Louisiana Farm Bureau (LFBF), the Natural Resources Conservation Service (NRCS), the Louisiana Cooperative Extension Service (LCES), USDA-Agriculture Research Service (ARS), LDEQ and agricultural producers.

The Master Farmer Program has three components: environmental stewardship, agricultural production and farm management. The environmental stewardship component has three phases. Phase one focuses on environmental education and implementation of crop-specific BMPs. Phase two of the environmental component includes in-the-field viewing of implemented BMPs on Model Farms. Phase three involves the development and implementation of farm-specific and comprehensive conservation plans by the participants. A member must participate in all three phases in order to gain program status and receive the distinction of being considered a master farmer.

Louisiana Cooperative Extension Service

LCES plays a very important role in the educational component of the NPS Management Program. They provide the farmers, local citizens, and science teachers and children with information on water quality, wetlands, habitat protection and a host of other environmental issues. Summer camps offer high school students the opportunity to learn about coastal environments,

marshes, and estuaries. Marsh Maneuvers has been a very popular learning experience for students to actually spend a week in the marsh, learning about every aspect of its unique ecology. LCES has hosted and participated in workshops for science teachers on water quality, nonpoint source pollution, watershed management and wetland protection. They are the backbone of the state's educational system for adults and children on agriculture and environmental issues, and it is anticipated that they will continue to be a major partner in this important area.

Department of Health and Hospitals

The DHH has worked on nonpoint source problems associated with home sewage systems across the Barataria-Terrebonne basins. In many areas, they have inventoried these systems and determined where maintenance problems exist or new systems need to be installed. They have worked with BTNEP and the Gulf of Mexico Program on the Shellfish Strategy and provided data and information on shellfish closures and oyster growing waters that are under stress from pollution. As BTNEP works with the Implementation Teams on the Action Items, DHH will continue to play a major role in addressing pollution that is associated with home sewage systems.

Coastal Management Division of Department of Natural Resources

CMD/DNR has been a partner in development of the CCMP for the BTNEP. Since portions of the Barataria and Terrebonne basins lie within the coastal zone management area, they have worked to understand how their programs and coastal use permits can be utilized to assist with managing water quality and habitat issues in Louisiana's coastal areas. They have participated in the Nonpoint Source Coalition meetings and educated people about the Coastal Nonpoint Pollution Control Program. As BTNEP moves into the implementation phase of their program and LDEQ moves into these basins for TMDL development and watershed management, CMD/DNR will continue to be an important partner to assist in the implementation of nonpoint source management practices.

South Central Planning and Development Commission

South Central Planning and Development Commission is a local entity that assists the cities and parishes with many of their planning and development programs. They have worked closely with LDEQ on implementation of nonpoint source

educational programs across the Barataria basin. They have hosted meetings with city and parish officials on nonpoint source issues and assisted LDEQ in building local support for the program. They have begun to work with the BTNEP staff on these educational programs and are expected to continue to be a major cooperator and supporter for both nonpoint source education and watershed implementation.

Local Parish and Municipal Governments

Local governments play such an important role in both the educational and watershed management portions of the NPS Management Program. They understand the local problems and infrastructure that is the mechanism for program implementation. They advise and guide LDEQ and BTNEP on how their action items can be achieved and how programmatic goals and objectives can be attained. Without their support, the program simply will not work. They understand the history of the local problems and the reasons why some solutions will work and others will fail. They have responsibilities to the people who live within the basin and need to be informed and involved in any decisions that may affect the people, economy or the resources in their area. Both BTNEP and LDEQ have worked to foster good working relationships with the local decision-makers and will continue to rely on their local expertise for future program implementation.

Local Environmental Community

The Environmental Community has supported the BTNEP and participated in the planning process for the CCMP. They have highlighted the environmental problems that exist with saltwater intrusion and wetland loss, nutrients and pesticides from agricultural crops, and pressured both industry and government to reduce pollution from both the point and the nonpoint sources that exist across the basin. They play an important role in raising the awareness of the public about the environmental problems that exist and working to ensure that everyone continues to work to reduce these problems. Both BTNEP and LDEQ will continue to work with them as implementation strategies and TMDLs are implemented throughout the basin.

Local Civic Organizations

The local civic and service organizations are comprised of key leaders within the community. These people care about their community and want to work on programs that improve the environment and their local economy. They are the farmers, the homeowners, and the city and

parish leaders that need to be involved in programs that educate the people about their water quality issues. They will be included in the educational outreach programs planned for TMDLs and watershed management and are viewed as local decision-makers in how these programs are implemented.

Local Universities, Schools

The universities and the schools have such an opportunity to become involved in the water quality, habitat protection and wetland issues that exist across the Terrebonne basin. Many of them have and already conduct their own water quality testing programs and have become involved in environmental education. As both the BTNEP and LDEQ work on watershed implementation, there will be opportunity for their involvement in many aspects of the programs. Surveys of home sewage systems, habitat assessment along bayous and streams, participation in demonstration projects and educational programs are all examples of activities that local schools and university students and teachers can become involved in. In some parts of the state, students have restored urban streams and worked with the Corp of Engineers to protect wetlands. They have innovative ideas and enjoy working on local issues where short-term progress can be seen.

7.4. Implementation and Maintenance

Locating funding for implementation and maintenance of best Management Practices are key elements in a successful Implementation Plan. There are a number of Federal and State funding sources that exist for BMP implementation, riparian zones, and land conservation.

7.4.1. Cost Share

The LDEQ Nonpoint Source Unit provides USEPA §319(h) funding to assist in the implementation of BMPs seeking to address water quality problems in areas listed on the §303(d) list. USEPA §319(h) funds are to be used to implement programs and projects designed to reduce nonpoint source pollution. 319(h) funds are available to all private, for profit and nonprofit organizations that are authenticated legal entities, or governmental jurisdictions including: cities, counties, tribal entities, federal agencies, or agencies of the state. Proposals are submitted by applicants through a Request for Proposal (RFP) process and require a non-federal match of 40% of the total project cost consisting of funds and/or in-kind services. Further information on funding from the Clean Water Act §319 (h) can be found on the LDEQ web site at: www.deq.state.la.us.

7.4.2. Other Federal and State Funding

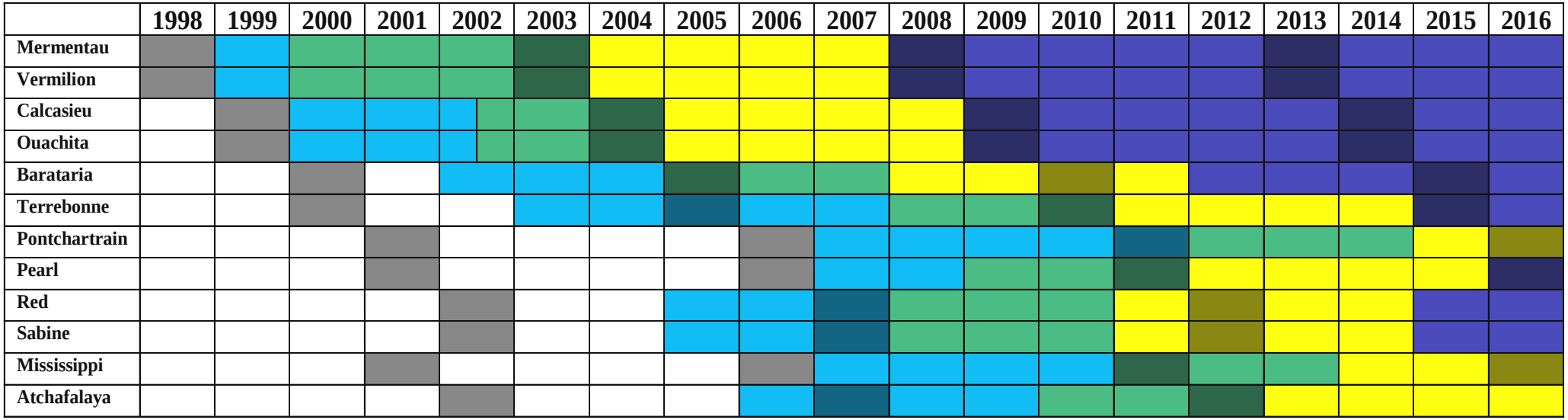
The United States Department of Agriculture (USDA) offers landowners financial, technical, and educational assistance to implement conservation practices on privately owned land with the goal of reducing soil erosion, improve water quality, and to enhance crop land, forest land, wetlands, grazing lands and wildlife habitat. One of the programs sponsored by the USDA is the Conservation Reserve Program (CRP). It is designed to encourage farmers to convert highly erosive cropland to vegetative cover, such as native grasses, wildlife plantings, trees, filter strips, or riparian buffers. Farmers receive annual rental payment for the term of the multi-year contract. An additional program, The Conservation Reserve Enhancement Program (CREP), combines the resources of the CRP program with that of the State government. This program focuses on NPS pollution, water and habitat restoration. The Environmental Quality Incentives Program (EQUIP) is another source of funding available to the farmers for conservation practices. These are only a few,of many, State and Federal funding sources available to agricultural landowners that will help with the cost of reducing NPS run off from their fields.

8.0 Timeline for Implementation

The NPS Implementation Plan for the Bayou Petit Caillou Watershed outlines a 4-year management plan to reduce NPS pollutants reaching the waterway. LDEQ intensively samples each watershed in the state once every 4 years to see if the water bodies are meeting water quality standards. Prior to 2004, water bodies were sampled once every 5 years. Therefore, sampling began during 2000 for the Terrebonne Basin, including Bayou Petit Caillou, and occurred again in 2005. Sampling will also occur in 2009 and in 2013 (Table 8). The data from 2005 will be used as a baseline to measure the rate of water quality improvement in samples taken in subsequent years. If no improvement in water quality is witnessed by the 2009 sampling,

8.1. Tracking and Evaluation

As stated in the Louisiana Nonpoint Management Plan, program tracking will be done at several levels to determine if the watershed approach is an effective method to reduce nonpoint source pollution and improve water quality. The following actions will be taken to determine effectiveness of this approach:



1. *Black Stripes = Collect Water Quality Data to Develop Total Maximum Daily Loads (TMDLs) and to Track Water Quality Improvement at the Watershed Level* ***[Objective 1****]*
2. *Light Blue = Develop Total Maximum Daily Loads for the Watersheds on the 303(d) List [****Objective 2]***
3. *Green = Develop Watershed Management Plans to Implement the NPS Component of the TMDL* ***[Objective 3]***
4. *Yellow = Implement the Watershed Management Plans* ***[Objectives 4-8]***
5. *Dark Blue = Develop and Implement Additional Corrective Actions Necessary to Restore the Designated Uses to the Water Bodies* ***[Objective 9-10]***

1. Tracking of BMP's implemented as a result of Section 319, EQIP or other sources of cost-share and technical assistance within the watershed (short term);

2. Tracking of actions with the Watershed Restoration Action Strategy (short term);

3. Tracking progress in reducing nonpoint source pollutants such as solids, nutrients, and organic carbon from the various land uses (rice, soybeans, sugar cane, crawfish farms) within the watershed (short-term);

4. Tracking water quality improvement in the bayou (i.e. total dissolved oxygen);

5. Documenting results of the tracking to the residents within the watershed and to EPA (short and long term).

9.0 Summary of the Plan

Bayou Du Large, Subsegment 120505, does not meet the water quality standards for dissolved oxygen and nutrients. With the aim of restoring the designated uses of fish and wildlife propagation, there needs to be a 85% reduction in the summer and winter of manmade nonpoint source loads. To attempt to meet this goal, a collaborative effort from the citizens of the area, special interest groups, and the government, is essential. These problems should be addressed through basin-wide educational programs encompassing restoration and management strategies for sugarcane, pastureland, home sewage systems, urban runoff and non native species. Best Management Practices and regulations are available for reducing non point source pollutant loads from these causes; and if followed properly, should reduce the suspected causes of impairments in the watershed. Financial support can be provided through USEPA §319(h) funds or by financial, technical, or educational assistance through the USDA.

The short-term goal for managing these water quality problems is to work with the local community, decision-makers, state and federal agencies to implement management measures and Best Management Practices that can reduce the concentration of sediment, nutrients, bacteria and metals leaving the land during rain fall events. The long-term water quality goal is to be able to measure a reduction in the in-stream concentration of these pollutants and to restore the designated uses for the water body. From the implementation of this watershed plan, we should expect to gain better working relationships among organizations; a better use of science to understand how human activities affect our water resources; a better protection for our water

bodies; and most importantly, cleaner water. Unfortunately, as is, Bayou Du Large has little to no flow and could be considered a cesspool for runnoff. The designated use for anything other than a drainage ditch is questionable. Even with the various BMPS implemented throughout the waterbody, it would be hard stretched to reach the 85% reduction in man-made pollution that has been requested of the TMDL. With the request for the DO criteria to be changed for Bayou Du Large, it is possible to consider that the nonpoint source reduction percentage could decrease.

Although some of the BMPs and their recommended courses of action were described within this plan, a consolidated list of BMPs recommended for each of these land uses can be viewed in the State of Louisiana Water Quality Management Plan, Volume 6 (LDEQ, 2000). Detailed BMP manuals for agronomic crops, rice, poultry, sugar cane, dairy, sweet potato, swine, beef, and aquaculture have been produced by LSU AgCenter and are available on their website http://www.lsuagcenter.com/Subjects/bmp/index.asp. For all entities involved in silvicultural operations, the Recommended Forestry Best Management Practices for Louisiana manual has been and will continue to be an invaluable source of information and recommendations (LDEQ, 2000).

Figure 12 Bayou Du Large near Old Service Station (UC1)

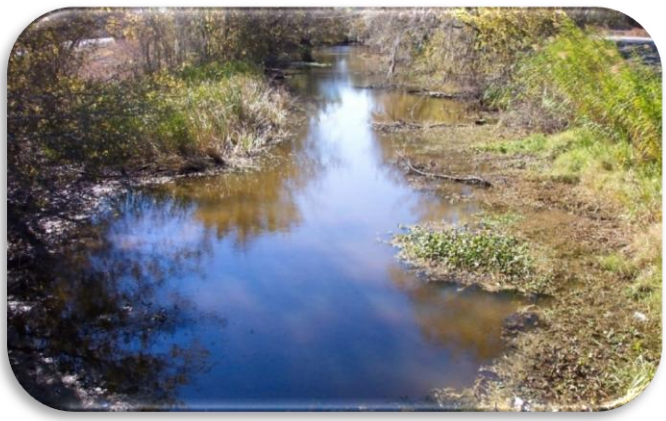


Figure 13 Bayou Du Large at Dr. Beatrous Rd (BDL6)

Figure 11 Bayou Du Large on Seven Oaks St. at Farm Rd. (BDL5)

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Environmental Protection Agency: www.epa.gov

Louisiana State University Ag Center: http://www.lsuagcenter.com

Appendix


Bayou Du Large
Subsegment 120505
Final Survey Map
OBDL1
BDL1
RKM 55
BDL2
DC1
RKM 50
BDL3
TPS1
BDL4
UC1
BDL5
WQN 0940
RKM 45
MC1
BDL6
USGS
7381323
BP1
BDL7
Survey Sites Description
BDL1 - Bayou Du Large - just below Old Bayou Du Large
BDL2 - Bayou Du Large - LA315 at Melvin Street
BDL3 - Bayou Du Large - LA315 at Tommie Darcy Drive
BDL4 - Bayou Du Large - LA315 south of Rock Street
BDL5 - Bayou Du Large - LA315 on Seven Oaks Street
BDL6 - Bayou Du Large - at Dr. Beatrous Road
BDL7 - Bayou Du Large - Bayou Provost and Marmand Canal
OBDL1 - Old Bayou Du Large
DC1 - Duplantis Canal
TPS1 - Unnamed Ditch to Terrebonne Parish Library
UC1 - Unnamed Canal
MC1 - Marmande Canal
BP1 - Bayou Provost
Legend
Bayou Du Large 120505 Survey Sites
Water Quality Network Sites
USGS Sites
Bayou Du Large Route
120505 Subsegment Boundary
Map Number: 200603012
Map Date: 5/09/06
Map Projection: UTM, NAD 83
Map Source: LDEQ, USGS
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Bayou DuLarge Model Layout Subsegment 120505 - Headwaters to Vernon Lake